DARPA Overview

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DARPA's mission

Breakthrough Technologies and Capabilities for National Security

Precision Guidance & Navigation

Communications/Networking **IR Night Vision**

Stealth **Radar Arrays** **UAVs** **Hypersonics**

1960s	1970s	1980s	1990s	2000s	2010s	2020s

Microelectronics VLSI, CAD, manufacturing, IR, RF, MEMS

ARPAnet/Internet **Autonomy**

Information Technology Timesharing, client/server, graphics, GUI, RISC, speech recognition

Materials Science Semiconductors, superalloys, carbon fibers, composites, thermoelectrics, ceramics

DARPA's role: Pivotal early investments that change what's possible

BREAKTHROUGH TECHNOLOGIES AND CAPABILITIES FOR NATIONAL SECURITY

YEARS	GOVT. EMPLOYEES	BUDGET	PROGRAMS	TECH OFFICES	YEARS OF AVG. PM TENURE
61	230	$3.5B	250+	6	4

DEFEND THE HOMELAND


Cyber deterrence


Countering hypersonics


Bio threat detection and mitigation

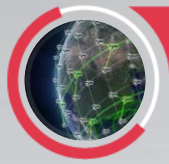

Defense against WMT

DETER & PREVAIL AGAINST HIGH-END ADVERSARIES


Long-range effects


Mosaic Warfare


Control of the EM spectrum


Robust space

EFFECTIVELY PROSECUTE STABILIZATION EFFORTS


Warrior performance


Countering gray warfare


3D city-scale operations


Behavior modeling and influence

FOUNDATIONAL RESEARCH

Understanding complexity, composable systems, advanced materials and electronics, trusted hardware and software, human-machine symbiosis, 3rd wave artificial intelligence, data and social science, new computing, and engineered biology.


Alternative computing


Engineered biology


Electronics Resurgence Initiative (ERI)


Artificial Intelligence Next Campaign

Increasing the pace of developing technologies and capabilities for the U.S. and allied warfighter

DARPA Technical Offices

DARPA and the Defense Sciences Office

DARPA: Create and prevent technological surprise

DSO—"DARPA's DARPA"

- Creates opportunities from scientific discovery
- Invests in multiple, often disparate, scientific disciplines--everywhere the rest of DARPA is, and more
- Focuses on mission-informed research

DSO: The Nation's first line of defense against scientific surprise

Current DSO Thrust Areas

Frontiers in Math, Computation & Design

(quantum information processing, alternative computing, foundational AI science, design tools)

Limits of Sensing & Sensors

(quantum sensing, imaging through scattering media, novel light matter interactions, 3D scene reconstruction)

Complex Social Systems

(new social science tools and methodologies, human-machine teaming, wargaming, deterrence)

Anticipating Surprise

(WMD/WMT detection, materials for harsh environments, advanced manufacturing, autonomy)

How We Think: The Heilmeier Catechism

Important questions to consider when approaching DARPA with ideas:

- What are you trying to do?
- How is it done today and who does it? What are the limitations of the present approaches?
- What is new about our approach, and why do we think it will succeed?
- If we succeed, what difference will it make?
- How long do we think it will take?
- What are our mid-term and final exams?
- How much will it cost?

Young Faculty Award (YFA)

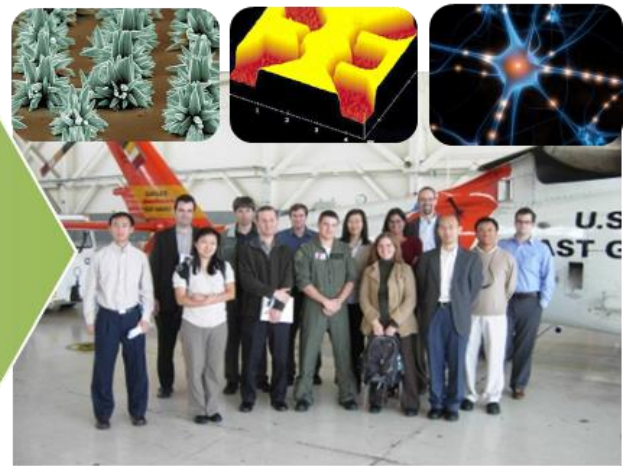
Identify and engage **rising stars** in junior research positions, emphasizing those without prior DARPA funding, and expose them to DoD needs and DARPA's program development process

The YFA program provides:

- Research funding
- DoD contacts
- Military visits/exercises
- PM Mentor

The YFA program yields:

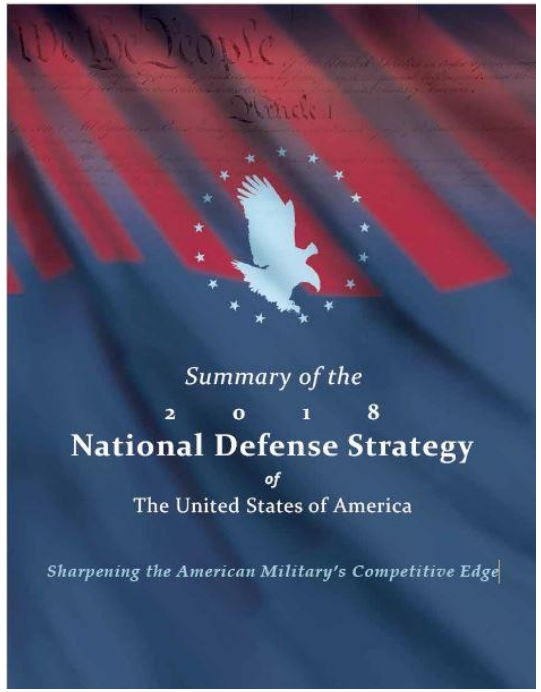
- Insight into DoD problems
- Novel ideas
- Career development
- Future DARPA performers



2021 YFA topics anticipated to be posted in September 2020

Develop the next generation of academic scientists, engineers, and mathematicians who will focus a significant portion of their career on DoD and National Security issues

Disruptioneering



- "Harness and protect the National Security Innovation Base"
- "Deliver performance at the speed of relevance"

– National Defense Strategy

Disruptioneering is a DSO rapid acquisition approach to increasing the speed of innovation:

- High risk concept exploration
- Acquisition tailored to speed (idea to program in 90 days)
- Program Announcement (DARPA-PA-20-01) released May 14, 2020:
  - https://beta.sam.gov/opp/2b0e8684bf054bcb8b9b280cb4498849/view#general

Artificial Intelligence Exploration (AIE)

AIE will enable DARPA to fund pioneering AI research to discover new areas where R&D programs may be able to advance the state of the art

- The pace of discovery in AI science and technology is accelerating worldwide
- The AI Exploration (AIE) program is part of DARPA's broader AI investment strategy that will help ensure the U.S. maintains a technological advantage in this critical area

- Program Announcement (DARPA-PA-20-02) released August 20, 2020:
  - https://beta.sam.gov/opp/667875ba2f464ccfa38688ea1a718fe7/view

This new approach enables DARPA to go from idea inception to exploration in fewer than 90 days!

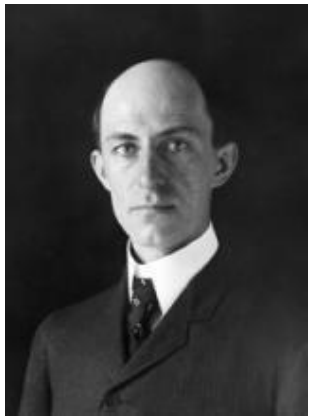
Evolutionary vs. Revolutionary R&D

"The flying machine which will really fly might be evolved by the combined and continuous efforts of mathematicians and mechanicians in from one million to ten million years"

- The New York Times
  - 9 October 1903

"We started assembly today"

- Orville Wright's Diary
  - 9 October 1903



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